REMARKS

Claims 1, 3, 4, 7, 12 and 21 are pending. Claims 8 and 13-20 had been withdrawn from consideration and have now been cancelled. Thus, Claims 2, 5, 6, 8-11 and 13-20 have been cancelled. Claims 1, 3 and 12 have been amended. Support for the amendments can be found in original Claim 2 and throughout the specification, such as, e.g., p. 3, lines 10 and p. 7, lines 21-23. No new matter is added. Favorable consideration of the currently pending claims is respectfully requested in light of the foregoing amendments and following remarks.

Rejection Under 35 U.S.C. §112

In the Office Action, Claims 1-4, 7, 12 and 21 are rejected as indefinite under 35 U.S.C. § 112, second paragraph. The Examiner asserts that the preamble of independent claim 1 is not commensurate in scope with the body of the claim because the body of the claim does not require that the coating applied to the substrate have reactive epoxy functionalities. Applicant has amended the body of Claim 1 to recite that "polymer growth <u>of a reactive epoxy containing coating</u> occurs on a surface of the substrate." Claim 12 has also been amended to clarify that "the reactive epoxy containing coating" refers back to Claim 1. Applicants thus respectfully request that the rejections under 35 U.S.C. § 112, second paragraph be withdrawn.

Rejections Under 35 U.S.C. §103:

In the Office Action, the Examiner rejected Claims 1, 3, 4, 7, 12 and 21 under 35 U.S.C. § 103(a) as unpatentable over Connell *et al.* (UK 1,037,144) in view of Timmons *et al.* (5,876,753) or vice versa. In addition, the Examiner rejected Claims 1, 3, 4, 7, 12 and 21 under 35 U.S.C. § 103(a) as unpatentable over Timmons *et al.* in view of Kolluri *et al.* (5,723,219), and Timmons *et al.* in view of Chabrecek *et al.* (WO 98/28026). Applicants respectfully submit that the amendments to the claims overcome the Examiner's rejection.

As an initial matter, in view of the Examiner's argument in the paragraph starting on page 11 of the Office Action and continuing onto page 12, applicants have amended Claim 1 to remove limitations directed to formulas I and IA and add a limitation to formula II from Claim 2, and Claim 2 has been cancelled. Accordingly, applicants submit that the amendment to Claim 1 overcomes the Examiner's argument, and, in view of this amendment, the following arguments from applicants' February 27, 2006, Amendment and Response are applicable and incorporated as follows:

> The process of plasma polymerization requires the careful choice of monomer and plasma conditions to provide a method where organic polymers can be deposited, as a thin-film, onto a variety of substrates. Prior to the work of applicants, it was believed that plasma chemists/physicists relied mostly on "low" (this being a relative term) powers, either continuous or pulsed, to retain monomer functionalities. However, the effect of plasma pulsing on free radical initiated polymerization has not been well understood. Applicants used monomers that are susceptible to free radical initiated polymerization (e.g., an acrylate or methacrylate). These monomers possess an unsaturated (C=C) group that will react with a radical (R') to produce RC-C'. This new radical can then add to another unsaturated group to produce a "growing" polymer chain that can further add to another unsaturated monomer.
>
> Although the **solution** chemistry of acrylates and methacrylates is extensively documented in the literature, the **plasma** chemist (such as Timmons *et al.*) has generally ignored these types of monomers. Thus, little is known about how such monomers behave in plasma conditions. Certainly, however, Timmons *et al.* fail to mention epoxy monomers, and applicants respectfully disagree with the Examiner's position that a person skilled in the art would extend the teaching of Timmons *et al.* to monomers that are known to involve such different chemistry.

> Applicants have found that a very short, low power pulse initiates such monomers and that growth of the polymer occurs during a relatively long **off** period. Thus, a high frequency pulse and short "on" time, resulting in much lower average power densities, is beneficial for the deposition of polymers, which rely substantially on free radical initiated polymerization.

Moreover, the Examiner's rejections under 35 U.S.C. § 103(a) are premised on the Examiner's analysis of Timmons *et al.,* and the Examiner's opinion that the pulsed plasma discharge conditions in Timmons *et al.* are either equivalent to those of the present application, or would require only routine experimentation to achieve. For the reasons discussed below, applicants submit that this opinion is incorrect, as the specification of the present application clearly shows that the pulsed plasma discharge conditions in Timmons *et al.* are different from those of the present application.

Examples 4 and 5 of the applicants' specification support the applicants' argument. These examples show that when the materials disclosed by Timmons *et al.* (AGE and butadiene monoxide) are treated according to applicants' low power pulsed method, unsatisfactory results are obtained. Thus for AGE (Example 4) films B and C are deposited by the pulsed method of the invention and it is reported that "some of the epoxy functionality has been lost" and that "the IR spectra . . . were very poor." Moreover the deposition is stated to have been "very slow" (*see* p. 18, lines 5 to 21). In Example 5, with butadiene monoxide, film E was made using applicants' pulsed method and again gave very slow deposition rates and a poor IR spectrum (i.e., a thin coating) (*see* p. 19, line 27 to p. 20, line 11).

This evidence clearly shows that applicants' method differs from that of Timmons *et al.* as these materials were satisfactorily treated by Timmons *et al.,* and thus supports applicants' argument that the materials that applicants are treating (i.e., acrylates and methacrylates) exhibit different chemistry than the materials used by Timmons *et al.* and

hence require conditions that are different from those of Timmons. Moreover, from this it is apparent that the Timmons process could not be combined with the methods of Connell *et al.*, Kolluri *et al.* or Chabrecek *et al.* in order to treat epoxy-containing monomers since the Timmons *et al.* process is inappropriate for this class of monomer. A person of ordinary skill in the art would appreciate that Timmons *et al.* is concerned with different types of monomers which polymerize in a chemically different manner. This also explains why Timmons *et al.* is completely silent about using epoxy-containing monomers in the disclosed method.

Finally, applicants note that the Examiner, while refusing to give patentable weight to applicants' claimed "average power density" limitation of 0.0025 W/cm^3 (*see, e.g.*, pages 7-8 of the Office Action), also intimates that the specification does not support the use of the claimed term. Applicants respectfully disagree. The examples described in the specification fall within the claimed limitation, even though the flask volume is not specifically provided. A person skilled in the art would understand that:

$$\text{Average power density} = \frac{\text{plasma on time}}{\text{plasma (on+off) time}} \times \frac{\text{peak power}}{\text{volume}};$$

$$\text{which approximates to:} \quad \frac{\text{on time}}{\text{off time}} \times \frac{\text{peak power}}{\text{volume}}.$$

$$\text{Thus, for the examples:} \quad \frac{1 \times 40}{1000 \times \text{volume}} = \frac{0.040}{\text{volume}} \ \text{W/ cm}^3$$

A skilled artisan would also understand that flask volume must be greater than 16 cm^3 and the average power density is therefore less than 0.0025 W/ cm^3 (0.040 / 16). None of the cited references disclose or suggest an average power density below 0.0025 W/ cm^3.

For at least the reasons discussed above, applicants submit that Timmons *et al.* fails to disclose or suggest all limitations of Claim 1, specifically, that "the pulsed plasma discharge is achieved by applying a power pulse to the plasma, each applied power pulse

having a power off time of from 10,000 to 20,000 μs and wherein an average power density of the pulsed plasma discharge is less than 0.0025 W/cm^3."

Moreover, Connell *et al.,* Kolluri *et al.* and Chabrecek *et al.,* either alone or in combination, fail to remedy the deficiencies of Timmons *et al.* discussed above. Each of these references disclose plasma deposition of epoxy-containing monomers with—among other materials—glycidyl methacrylate. However, the conditions under which such plasma depositions are carried out are substantially different from those disclosed by Timmons *et al.* In Connell *et al.,* the plasma is continuous and not pulsed. In Kolluri *et al.* and Chabrecek *et al.*, although the plasma is pulsed, the power levels are high in comparison to Timmons *et al.* Accordingly, there is no teaching, suggestion or motivation for a skilled person to apply the relatively low power method of Timmons *et al.* with the epoxy-containing monomers such as glycidyl methacrylate when it was already known to use either continuous plasma or relatively high-power pulsed plasma methods with these materials.

Accordingly, applicants submit that claims 1, 3, 4, 7, 12 and 21 are patentable over the cited combinations, and respectfully request that the rejections of these claims be withdrawn.

CONCLUSION

Based upon the amendments and remarks provided above, applicants believe that Claims 1, 3, 4, 7, 12 and 21 are in condition for allowance. A Notice of Allowance is therefore respectfully solicited.

No additional fees are believed due; however, the Commissioner is hereby authorized to charge any additional fees that may be required, or credit any overpayment, to Deposit Account No. 11-0855.

If the Examiner believes any informalities remain in the application that may be corrected by Examiner's Amendment, or there are any other issues that can be resolved by telephone interview, a telephone call to the undersigned attorney at (404) 815-6500 is respectfully solicited.

Respectfully submitted,

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